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REMARKS

Claims 1-3, 11-16 and 20-25 are pending in this application for the Examiner's review and consideration. Claim 1 was amended to more clearly recite that at least one of the high-index thin layers that has a refractive index value of at most 2.40 and is a high-index multilayer comprising at least one titanium oxide layer and at least one additional high index layer having a refractive index of at most 2.3 (*See, e.g.*, Specification, page 3, lines 24-27 and page 7, lines 14-17). No new matter has been added so entry of the claims at this time is warranted.

THE REJECTION UNDER 35 U.S.C. § 112, FIRST PARAGRAPH

Claims 1-3, 11-16, and 20-25 were rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. In response Applicants have amended independent claim 1 to more clearly recite the invention. Claim 1, as amended, now clearly recites that at least one of the high-index thin layers that has a refractive index value of at most 2.40 and is a high-index multilayer comprising at least one titanium oxide layer and at least one additional high index layer having a refractive index of at most 2.3 (*See, e.g.*, Specification, page 3, lines 24-27 and page 7, lines 14-17). Claim 1, as amended, now avoids the confusion that there is a separate additional layer having a refractive index of at most 2.3. For the above reasons, Applicants respectfully request that the rejection of claims 1-3, 11-16, and 20-25 under 35 U.S.C. § 112, first paragraph, be reconsidered and withdrawn.

THE REJECTION UNDER 35 U.S.C. § 103(A)

Claims 1-3, 11-16, 20-23 and 25 were rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 5,073,451 to Iida et al. ("Iida") in view of U.S. Patent No. 5,800,933 to Hartig et al. ("Hartig") for the reasons set forth on pages 3-4 of the Office Action. Applicants respectfully traverse the rejection.

Iida discloses a heat insulating glass plate with a multilayer coating which has low transmittance for solar radiation, high transmittance for visible light and radio waves, good durability, and suitability for use as a vehicle window glass (*See e.g.*, Iida, column 2, lines 39-44). Iida also discloses that the multilayer coating is a lamination of transparent and dielectric layers and has three essential layers in which the middle layer is higher or lower in refractivity than the inner and outer layers (*See e.g.*, Iida, column 2, lines 45-56). Specifically, Iida discloses a multilayer coating having a first layer with a refractive index in the range of 1.8-2.1, a second layer with a refractive index in the range of 2.2-2.5, and a third layer having a refractive index in the range of 1.8-2.1 (*See e.g.*, Iida, column 2, lines 45-56). Optionally, the multilayer may comprise a fourth layer having a refractive index in the range of 2.2-2.5 and a fifth layer having a refractive index in the range of 1.8-2.1 (*See e.g.*, Iida,

column 3, lines 1-7). In another embodiment, the fourth layer has a refractive index in the range of 1.4 to 1.7 and the fifth layer has a refractive index in the range of 1.8 to 2.5 (*See, e.g.*, Iida, column 4, lines 14-21).

Hartig discloses a low E sputter coated layer system for automotive and architectural purposes of the basic Si_3N_4/Ni Cr/Ag/NiCr/S_3N_4 type, improved by either an undercoat of TiO_2 or the use of stainless steel in the Si_3N_4 layer, or both (*See e.g.*, Hartig, column 6, lines 8-18).

Claim 1, as amended, recites a transparent substrate having at least one surface comprising an antireflection coating made of a multilayer stack comprising alternating thin layers of high and low refractive indices, wherein

(a) at least one of the high-index thin layers has a refractive index value of at most 2.40 and is a high-index multilayer comprising at least one titanium oxide layer and at least one additional high index layer having a refractive index of at most 2.3, and

(b) the layers of low refractive index have a refractive index of between 1.30 and 1.65.

Iida fails to disclose or suggest alternating thin layers of high and low refractive indices, wherein the layers of low refractive index have a refractive index of between 1.30 and 1.65, as recited in claim 1, as amended. Rather, Iida discloses layers having a refractive index of 1.8-2.1 (*See e.g.*, Iida, column 2, lines 38-56). A refractive index of 1.8-2.1, as disclosed by Iida, is not considered by a person of ordinary skill in the art as a low refractive index (*See e.g.*, Iida, column 2, lines 38-56). A refractive index in the range of 1.8-2.1 is considered as intermediate to high.

The Examiner, however, alleges that Iida discloses that the second and fourth layer can be silicon oxide or aluminum oxide and that these can have a have a refractive index of between 1.4 and 1.7 (*See, e.g.*, Office Action, ¶ 6). Applicants respectfully disagree with the Examiner's analysis.

First there is absolutely no disclosure in Iida that the second and fourth layers can have a refractive index of between 1.4 and 1.7. Only the fourth layer can have a refractive index of between 1.4 and 1.7. The second layer must have a refractive index in the range 2.2 to 2.5 (*See, e.g.*, Iida, column 2, lines 50-53). Although each of these layers can be made of silicon oxide or aluminum oxide, this does not mean that they will each have a refractive index of between 1.4 and 1.7. Iida merely discloses that silicon oxide, SiO_x ($0 < x \leq 2$) and aluminum oxide AlO_x ($0 < x \leq 1.5$), i.e., silicon oxide and aluminum oxide with specific rations of silicon or aluminum to oxygen, are useful for the dielectric compound having a refractive index in the range of 1.4 to 1.7 (*See, e.g.*, Iida, column 4, lines 29-32). This disclosure, however, does not mean that *both* the second and fourth layers can have a refractive index of between 1.4 and 1.7 as alleged by the Examiner. Indeed, Iida clearly states that the second layer must have a refractive index in the range 2.2 to 2.5 (*See, e.g.*, Iida,

column 2, lines 50-53). Accordingly, Iida, at best, discloses a multilayer coating wherein *one* layer (the fourth layer) has a refractive index in the range 1.4 to 1.7 and another layer (the second layer) has a refractive index in the range of 2.2 to 2.5. Such a disclosure, however, does not describe the invention that requires alternating thin layers of high and low refractive indices, wherein *all* the layers of low refractive index have a refractive index of between 1.30 and 1.65. In the multilayer stack of Iida only *one* layer (the fourth layer) would have a refractive index within the claim. There is no disclosure of *alternating* thin layers of high and low refractive indices, wherein *all* the layers of low refractive index have a refractive index of between 1.30 and 1.65, as presently claimed. Clearly, there is no disclosure or suggestion in Iida of a transparent substrate wherein the multilayer stack comprising alternating thin layers of high and low refractive indices has a formula (high-index layer/low-index layer)$_n$, wherein n is 2 or 3, as recited in dependent claim 14. Again, as discussed above, Iida, at best, discloses only one low refractive index layer having a refractive index in the claimed range of 1.30 to 1.65.

Hartig does not remedy the deficiencies in Iida. The Examiner cites Hartig as disclosing a high refractive index multilayer comprising titanium oxide and silicon nitride, and alleges that it would have been obvious to use the high index titanium oxide containing layer of Hartig in the film of Iida. Even if the titanium oxide layer of Hartig was used as a high refractive index layer in the multilayer film disclosed in Iida, it would not result in the claimed multilayer coating having alternating thin layers of high and low refractive indices, wherein the layers of low refractive index have a refractive index of between 1.30 and 1.65. Rather the combination would disclose, at best, a multilayer film having a high refractive index layer comprising titanium oxide, as disclosed in Hartig, and intermediate to high refractive index layers of between 1.8 and 2.1 and a *single* low refractive index layer having a refractive index ranging from 1.4 to 1.7 as disclosed in Iida (rather than *all* of the low refractive index layers having a refractive index between 1.3 and 1.65, as presently claimed).

Accordingly, neither Iida nor Hartig, alone or in combination, suggest the claimed multilayer coating. As explained above, neither Iida nor Hartig, alone or in combination, suggests an antireflection coating having alternating thin layers of high and low refractive indices, wherein *all* the layers of low refractive index have a refractive index of between 1.30 and 1.65. Moreover, neither Iida nor Hartig, alone or in combination, would have provided a reasonable expectation that the presently claimed antireflection coating, which expressly recites alternating thin layers of high and low refractive indices, wherein the low refractive index layers have a refractive index between 1.3 and 1.65, would have been successful. Indeed, the claimed antireflection coating provides increased optical performance by giving the substrate greater "stability" in its appearance to reflection (*See e.g.*, Specification, page 5, lines 11-13). Therefore, Iida in view of Hartig does not render the present claims obvious.

With respect to claims 2-3, 11-16, 20-23 and 25, Applicants note that these claims depend, directly or indirectly from claim 1, which, as noted above, are not rendered obvious by Iida in view of Hartig. Accordingly, these claims are also allowable over Iida in view of Hartig. For the above reasons, Applicants respectfully request that the rejection of claims 1-3, 11-16, 20-23, and 25 under U.S.C. § 103(a) be reconsidered and withdrawn.

Claim 24 was rejected under 35 U.S.C. § 103(a) as being obvious over Iida in view of U.S. Patent No. 5,948,544 to Kim et al. ("Kim") for the reasons set forth on pages 3-4 of the Office Action. Applicants respectfully traverse the rejection.

Kim discloses a polyester multilayer sheet and a process for preparing the sheet (*See e.g.*, Kim, column 2, lines 40-41.) The sheet has good impact strength, weatherability, and transparency (*See e.g.*, Kim, column 2, lines 40-44).

Kim fails to remedy the deficiencies in Iida or Hartig. The Examiner simply cites Kim as disclosing a polycarbonate or polyacrylate polymer in place of glass as a substrate. There is absolutely no disclosure or suggestion in Kim of an antireflection coating that has alternating thin layers of high and low refractive indices, wherein the low refractive index layers have a refractive index between 1.3 and 1.65. Therefore, Applicants respectfully request that the rejection of claim 24 under U.S.C. § 103(a) be reconsidered and withdrawn.

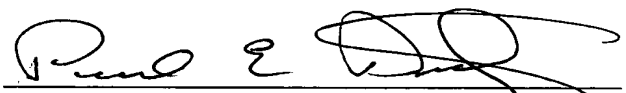
CONCLUSIONS

Applicants believe that all pending claims are now in condition for allowance, early notice of which would be appreciated. Should the Examiner not agree with this position, a personal or telephone interview is respectfully requested to discuss any remaining issues in an effort to expeditiously advance the application to allowance.

No fee is believed to be due for this submission. Should any fees be due, please charge the required fees to Pennie & Edmonds LLP Deposit Account No. 16-1150.

Respectfully submitted,

Date May 28, 2003



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Enclosure

Appendix A

Change to the Claims

Application No.09/761,765; filed January 18, 2001

1. (currently amended) A transparent substrate having at least one surface comprising, ~~on at least one of its surfaces,~~ an antireflection coating made of a multilayer stack comprising alternating thin layers of high and low refractive indices, ~~(a)~~ wherein

(a) at least one of the high-index thin layers has a refractive index value of at most 2.40 and is a high-index multilayer comprising at least one titanium oxide layer~~, (b) there is~~ and at least one additional high index layer~~,~~ having a refractive index of at most 2.3, and

(b) ~~(c)~~ the layers of low refractive index have a refractive index of between 1.30 and 1.65.

Appendix B
Currently Pending Claims
Application No.09/761,765; filed January 18, 2001

1. (currently amended) A transparent substrate having at least one surface comprising, an antireflection coating made of a multilayer stack comprising alternating thin layers of high and low refractive indices, wherein

(a) at least one of the high-index thin layers has a refractive index value of at most 2.40 and is a high-index multilayer comprising at least one titanium oxide layer and at least one additional high index layer having a refractive index of at most 2.3, and

(b) the layers of low refractive index have a refractive index of between 1.30 and 1.65.

2. (previously amended) The transparent substrate of claim 1, wherein the refractive index of the high-index multilayer comprising at least one titanium oxide layer is between 2.25 and 2.38.

3. The transparent substrate of claim 1, wherein the thin layers comprise a dielectric material, a low emissivity material, or a solar-protection coating.

11. (previously amended) The transparent substrate of claim 1, wherein the at least one additional high index layer has a refractive index of between 1.9 and 2.2 and comprises tantalum oxide, zirconium oxide, tin oxide, indium oxide, zinc oxide, silicon nitride, or aluminum nitride.

12. (previously amended) The transparent substrate of claim 1, wherein the high-index multilayer comprises two contiguous layers and the additional high index layer is closer to the substrate than the titanium oxide layer.

13. The transparent substrate of claim 12, wherein the absolute value of the difference between the refractive index of the additional high index layer less the refractive index of the titanium oxide layer is between 0.1 and 0.6.

14. (previously amended) The transparent substrate of claim 1, wherein the low index thin layers comprise one or more of silicon oxide, aluminum oxide, aluminum oxyfluoride, aluminum fluoride, and magnesium fluoride, wherein the oxides are optionally halogenated.

15. The transparent substrate of claim 14, wherein the thin layer of the antireflection coating most removed from the substrate is a low index layer comprising a SiO_2-Al_2O_3, wherein the atomic percent of aluminum with respect to silicon is from 5 to 20 percent.

16. The transparent substrate of claim 14, wherein the multilayer stack comprising alternating thin layers of high and low refractive indices antireflection coating has a formula $(\text{high-index layer/low-index layer})_n$, wherein n is 2 or 3.

20. (previously amended) A glazing comprising the transparent substrate of claim 1.

21. The glazing of claim 20, further comprising a layer or multilayer stack that is a solar protection layer, a heat absorbing layer, a UV protecting layer, an antistatic layer, a low emissivity layer, a heated layer, an anti-fouling layer, a hydrophobic organic layer having an anti-rain function, a hydrophilic organic layer having an anti-fogging function, or a silvering layer.

22. The glazing of claim 21, wherein the glazing comprises extra-clear glass or solid-tinted glass and wherein the glazing is optionally, toughened, reinforced, curved, or bent.

23. The glazing of claim 21, wherein the glazing comprises a transparent polymer material.

24. The glazing of claim 22, wherein the transparent polymer material comprises a polycarbonate or a polyacrylate.

25. (previously amended) The glazing of claim 21, for use as the internal or external glazing for buildings, to protect paintings, a motor-vehicle window, a mirror, a display screen, a decorative glass, a shop window, a shop-counter, or a refrigerated display-cabinet.